

## WHAT IS CLAIMED IS:

1. A method comprising the steps of:
  - a) providing a mixture comprising:
    - i) fluorinated carbon nanotubes;
    - ii) a quantity of metal hydroxide species; and
    - iii) a quantity of alcohol species, the species comprising at least two hydroxyl groups; and
  - b) reacting the mixture to yield functionalized carbon nanotubes with hydroxyl-terminated moieties attached to their sidewalls.
2. The method of claim 1, wherein the fluorinated carbon nanotubes are made by a process comprising contacting fluorine with carbon nanotubes selected from the group consisting of single-wall carbon nanotubes, multi-wall carbon nanotubes, double-wall carbon nanotubes, buckytubes, fullerene tubes, tubular fullerenes, graphite fibrils, and combinations thereof.
3. The method of claim 1, wherein the fluorinated carbon nanotubes have a stoichiometry from about  $C_1F_{0.01}$  to about  $C_2F$ .
4. The method of claim 1, wherein the metal hydroxide is selected from the group consisting of LiOH, NaOH, KOH, and combinations thereof.
5. The method of claim 1, wherein the alcohol species is of the general formula  $R(OH)_n$ , where n is at least two and R is an organic backbone.
6. The method of claim 5, wherein the metal hydroxide and at least some of the alcohol species are reacted to form a mono-metal salt of the alcohol species,  $MOR(OH)_{n-1}$ .

7. The method of claim 1, further comprising a step of dispersing the fluorinated carbon nanotubes in a quantity of the alcohol species.
8. The method of claim 1, wherein the step of reacting involves heating.
9. The method of claim 1, wherein the step of reacting involves mixing.
10. The method of claim 1, wherein the step of reacting involves ultrasonication.
11. The method of claim 1, further comprising a step of filtering to collect a filtered product comprising the functionalized carbon nanotubes with hydroxyl-terminated moieties attached to their sidewalls.
12. The method of claim 11, further comprising washing and drying the filtered product.
13. A method comprising the steps of:
  - a) providing a mixture comprising:
    - i) fluorinated carbon nanotubes;
    - ii) a quantity of a metal salt of an alcohol species, the alcohol species comprising at least two hydroxyl groups, mixed with the fluorinated carbon nanotubes; and
  - b) reacting the mixture to yield functionalized carbon nanotubes with hydroxyl-terminated moieties attached to their sidewalls.
14. The method of claim 13, wherein the fluorinated carbon nanotubes are made by a process comprising contacting fluorine with carbon nanotubes selected from the group consisting of single-wall carbon nanotubes, multi-wall carbon nanotubes,

double-wall carbon nanotubes, buckytubes, fullerene tubes, tubular fullerenes, graphite fibrils, and combinations thereof.

15. The method of claim 13, wherein the fluorinated carbon nanotubes have a stoichiometry from about  $C_1F_{0.01}$  to about  $C_2F$ .
16. The method of claim 13, wherein the alcohol species is of the general formula  $R(OH)_n$ , where n is at least two and R is an organic backbone.
17. The method of claim 16, wherein the metal salt of the alcohol species is of the general formula  $MOR(OH)_{n-1}$ .
18. The method of claim 1, further comprising a step of dispersing the fluorinated carbon nanotubes in a quantity of the alcohol species.
19. Functionalized carbon nanotubes made a process comprising the steps of:
  - a) providing a mixture comprising:
    - i) fluorinated carbon nanotubes;
    - ii) a quantity of a metal salt of an alcohol species, the alcohol species comprising at least two hydroxyl groups, mixed with the fluorinated carbon nanotubes; and
  - b) reacting the mixture to yield functionalized carbon nanotubes with hydroxyl-terminated moieties attached to their sidewalls.
20. The functionalized carbon nanotubes of claim 19, wherein the fluorinated carbon nanotubes are made by a process comprising contacting fluorine with carbon nanotubes selected from the group consisting of single-wall carbon nanotubes, multi-wall carbon nanotubes, double-wall carbon nanotubes, buckytubes, fullerene tubes, tubular fullerenes, graphite fibrils, and combinations thereof.

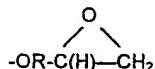
21. The functionalized carbon nanotubes of claim 19, wherein the fluorinated carbon nanotubes have a stoichiometry from about  $C_1F_{0.01}$  to about  $C_2F$ .
22. The functionalized carbon nanotubes of claim 19, wherein the alcohol species is of the general formula  $R(OH)_n$ , where n is at least two and R is an organic backbone.
23. The functionalized carbon nanotubes of claim 22, wherein the alcohol species is bis-phenol A.
24. The functionalized carbon nanotubes of claim 22, wherein the metal salt of the alcohol species is of the general formula  $MOR(OH)_{n-1}$ .
25. The functionalized carbon nanotubes of claim 19, further comprising a step of dispersing the fluorinated carbon nanotubes in a quantity of the alcohol species.
26. The functionalized carbon nanotubes of claim 19, having a general formula  $CNT-[OR(OH)_m]_x$ , where R is an organic backbone, m is at least one, and x is from about 1 to about 500 per 1,000 nanotube carbon atoms.
27. The functionalized carbon nanotubes of claim 19, wherein the functionalized carbon nanotubes are additionally functionalized on their ends.
28. The functionalized carbon nanotubes of claim 23, further comprising a step of reacting the functionalized carbon nanotubes with epichlorohydrin to form carbon nanotubes functionalized on their sidewalls with epoxide-terminated moieties.
29. Functionalized carbon nanotubes comprising a plurality of carbon nanotubes having functional groups attached to the sidewalls of the carbon nanotubes, wherein:
  - a) the functional groups are of the form  $-OR(OH)_m$ ;

- b) R is an organic backbone; and
- c) m is at least one.

30. The functionalized carbon nanotubes of claim 29, wherein there are from about 1 to about 500 functional groups attached to the sidewalls of the carbon nanotubes per 1,000 nanotube carbon atoms.

31. The functionalized carbon nanotubes of claim 29, wherein the functionalized carbon nanotubes are additionally functionalized on their ends with the functional groups.

32. Functionalized carbon nanotubes comprising a plurality of carbon nanotubes having functional groups comprising epoxide moieties attached to the sidewalls of the carbon nanotubes, wherein:

- a) the functional groups are of the form  
 ; and
- b) R is an organic backbone.

33. The functionalized carbon nanotubes of claim 32, wherein there are from about 1 to about 500 functional groups attached to the sidewalls of the carbon nanotubes per 1,000 nanotube carbon atoms.